

BACTERIOLOGICAL WATER QUALITY OF CAMERON LAKE

by

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Abstract

During the five-day survey of Cameron Lake, August 17 to 21, 1970, the water was acceptable for recreational use. However, a cautionary note must be included to indicate a possible discharge of fecal material through the soil with a time lag between peak cottager population and appearance of pollution in the water. This discharge could cause a public health hazard and negate the acceptability of the lake for recreational use. Further investigation is required before this hypothesis can be proven or disproven.

The Burnt River and Rosedale River had a large influence on the lake stations near their mouth.

Introduction

During the month of August (August 17 to 21, 1970), a single 5-day intensive bacteriological survey of Cameron Lake was undertaken. Cameron Lake is a four mile long by two mile wide lake located on the Trent Canal System in Victoria County. The lake receives water from Balsam Lake via the Rosedale River and the Trent Canal at Lock 35, from the Burnt River, and from a number of small creeks such as Martin Creek and Perrin Creek. The lake empties into the Fenelon River via a dam above the Fenelon Falls and Lock 34 of the Trent Canal.

The largest area of development on or around the lake is the village of Fenelon Falls located at the outflow of the lake. Cottage development is scattered along the southern and western shores from Deihl Point to Deweys Island and the Trent Canal at Lock 35. There is a lesser amount of development on the northern and western shores in the region of Cranberry Bay and Fells Bay.

Cameron Lake was sampled daily for five days at 23 surface stations and 3 depth stations. In addition, one station (C24) was located upstream on the Burnt River and a station (B32) was located at the Rosedale River.

Methods

The surface samples were taken in sterile 250 ml autoclavable polycarbonate bottles from approximately one metre below the water surface. Depth samples were taken using sterile 237 ml air syringes employing a modified "piggy back" sampler. All samples were analyzed bacteriologically for total coliform (TC), fecal coliform (FC) and fecal streptococcus (FS), usually 2 to 6 hours after sampling.

Statistical evaluation of the results was based on the geometric means of the bacterial counts obtained at stations during the survey. All means were compared to the water quality criteria for total body contact recreation as set forth in the OWRC "Guidelines and Criteria for Water Quality Management in Ontario" (June 1970).

Discussion and Results

The station location and the geometric means of the bacterial counts are presented on the map (Figure 1).

In general, Cameron Lake during this mid-August survey was bacteriologically acceptable for body contact recreational use according to the OWRC water quality criteria. The main deviation from acceptability was in the total coliform and fecal streptococcus parameters in the region of the

inflow from the Burnt and Rosedale Rivers (stations C11, C12, C13, C24 and B32) and in the total coliform parameter at the inflow of Perrin Creek (station C16) .

In the first case, a high TC level at the Balsam Lake station B32 (4490/100 ml) was carried downstream via the Rosedale River into Cameron Lake. This resulted in high TC levels at station C11 (2508/100 ml), C12 (1129/100 ml) and C13 (1462/100 ml) . Superimposed on this situation, a high FS level at the Burnt River station C24 was carried downstream to appear as an elevated FS level at station C11 (53/100 ml) . This elevated FS level without the high TC and FC levels at C24 indicated a natural-type, animal pollution from this source. Thus the high TC and FS levels at station C11 and the high TC levels at stations C12 and C13 may have indicated some local sources of pollution, but more probably only indicated the zone of influence of the inflowing Burnt and Rosedale Rivers .

At station C16, a TC level which just exceeds the recreational water quality criteria at 1084 TC/100 ml indicated the influence of the shallow swampy conditions around the mouth of Perrin Creek. Some pollution upstream in Perrin Creek may have contributed to this TC level but did not appear in any of the other bacteriological parameters .

The FC levels at all stations connected with the survey of Cameron Lake were well below the recreational water quality criteria of 100 FC/100 ml. But at a large number of stations (C2, C3, C4, C7, C13 to C23), counts of greater than 100 FC/100 ml were obtained on one or two days during the survey. These high FC counts were obtained on Wednesday, August 19 or Thursday, August 20.

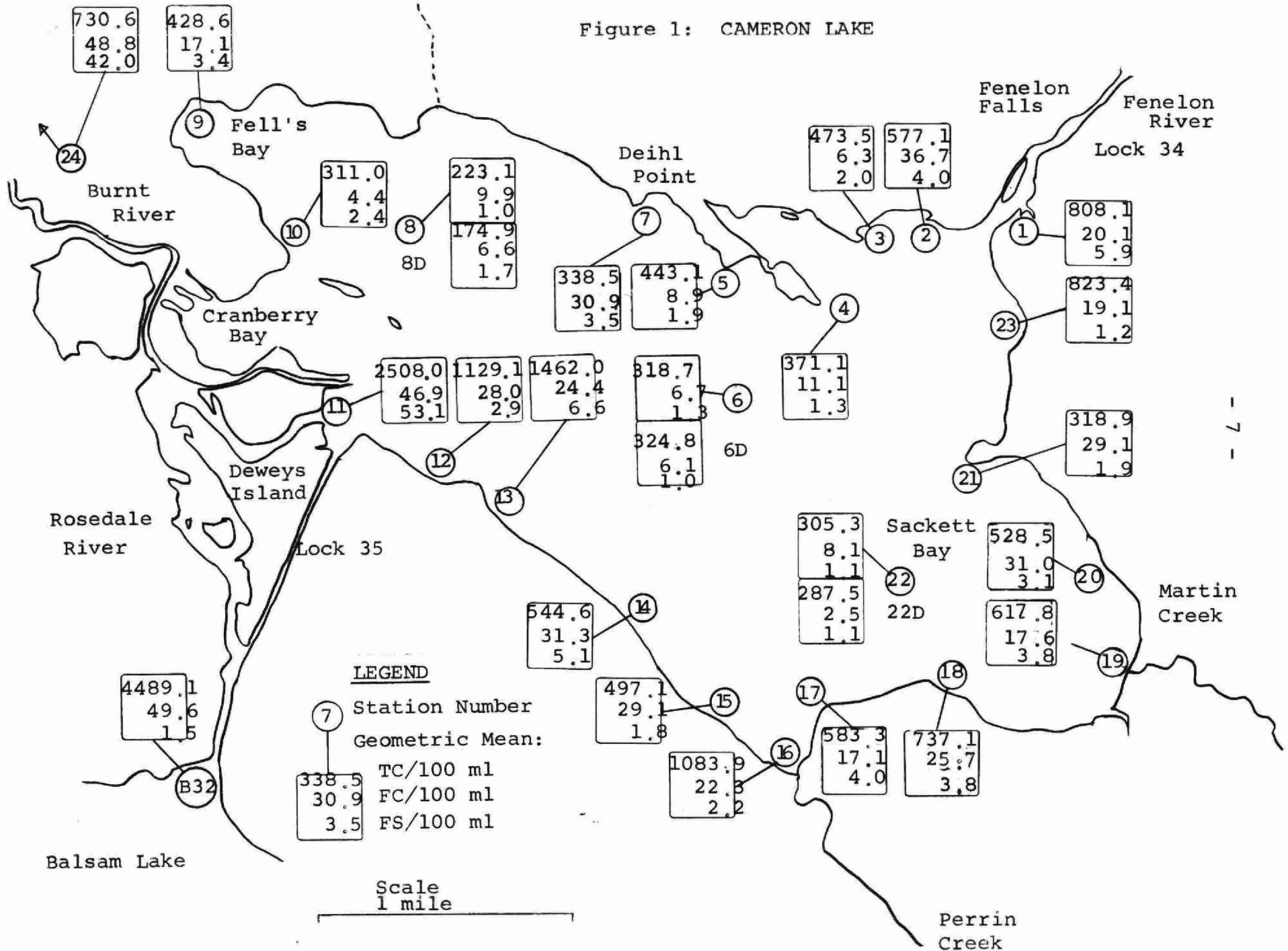
The weather seemed to play a minor role in this occurrence since air temperatures prior to and during this time in the 60°F to 80°F range (Fenelon Falls) and rainfall occurred on the mornings of August 12 (.22 inches at Fenelon Falls) and of August 19 (.02 inches at Fenelon Falls).

All stations affected, however, were located in the area of cottage development. This common location factor suggests the possibility of a pollution from the cottages which has been delayed by a period of travel through soil before reaching the water. For this reason, a cautionary note might be included in the acceptance of the water for recreational use because, if this theory is proven true, a public health hazard occurs during or slightly after peak residential periods for a short period of time. Further investigation will be required to prove or disprove this theory.

Recommendations

- 1) That further studies be instituted to study the travel of fecal material through soil to a body of water.
- 2) That a survey period of greater than five days be used on all lakes to add both statistical significance to the data and longer period trend analysis.
- 3) That where a few large rivers and streams have an influence on the lake sufficient stations be located on that river or stream to measure its influence.

Figure 1: CAMERON LAKE



Lake: Cameron

Date: August 17 - 21, 1970

Survey: 1st

Station Number	Parameter	Number of Observations	Geometric Mean (GM) per 100 ml.	95% Confidence Limits on GM	
				Upper	Lower
C 1	TC	5	808.1	1672.1	390.6
	FC	5	20.1	62.8	6.4
	FS	5	5.9	10.2	3.4
C 2	TC	5	577.1	981.4	339.4
	FC	5	36.7	211.0	6.4
	FS	5	4.0	14.4	1.1
C 3	TC	5	473.5	1271.5	176.3
	FC	3	6.3*	17.2	2.3
	FS	5	2.0	6.9	0.6
C 4	TC	5	371.1	761.4	180.9
	FC	5	11.1	70.5	1.7
	FS	5	1.3	2.1	0.8
C 5	TC	5	443.1	483.2	406.4
	FC	5	8.9	68.2	1.2
	FS	5	1.9	4.7	0.8
C 6	TC	5	318.7	720.4	141.0
	FC	5	6.7	63.6	0.7
	FS	5	1.3	2.8	0.6
C 6 D	TC	5	324.8	795.8	132.6
	FC	5	6.1	68.3	0.6
	FS	5	1.0	1.0	1.0
C 7	TC	5	338.5	615.3	186.2
	FC	5	30.9	90.2	10.6
	FS	5	3.5	12.5	1.0
C 8	TC	4	223.1	530.1	93.9
	FC	4	9.9	156.7	0.6
	FS	4	1.0	1.0	1.0

Lake: Cameron (continued)

Station Number	Parameter	Number of Observations	Geometric Mean (GM) per 100 ml.	95% Confidence Limits on GM	
				Upper	Lower
C 8 D	TC	4	174.9	232.2	131.7
	FC	4	6.6	262.4	0.2
	FS	4	1.7	8.8	0.3
C 9	TC	3	428.6*	675.8	271.9
	FC	4	17.1	81.0	3.6
	FS	4	3.4	32.7	0.3
C 10	TC	3	311.0	1461.9	66.2
	FC	4	4.4	73.3	0.3
	FS	4	2.4	12.7	0.5
C 11	TC	4	2508.0	13,483.5	466.5
	FC	4	46.9	106.6	20.6
	FS	4	53.1	208.8	13.5
C 12	TC	5	1129.1	5182.0	246.0
	FC	5	28.0	45.1	17.4
	FS	5	2.9	6.9	1.2
C 13	TC	5	1462.0	3319.7	643.9
	FC	5	24.4	376.6	1.6
	FS	5	6.6	46.7	0.9
C 14	TC	4	544.6	2429.3	122.1
	FC	4	31.3	431.9	2.3
	FS	4	5.1	108.1	0.2
C 15	TC	4	497.1	2130.2	116.0
	FC	4	29.1	518.4	1.6
	FS	4	1.8	11.1	0.3
C 16	TC	5	1083.9	2971.8	395.3
	FC	5	22.3	286.9	1.7
	FS	5	2.2	8.1	0.6
C 17	TC	4	583.3	1982.0	171.7
	FC	4	17.1	1002.2	0.3
	FS	4	4.0	59.6	0.3

Lake: Cameron (continued)

Station Number	Parameter	Number of Observations	Geometric Mean (GM) per 100 ml.	95% Confidence Limits on GM	
				Upper	Lower
C 18	TC	4	737.1	1320.6	411.4
	FC	4	25.7	522.9	1.3
	FS	4	3.8	35.3	0.4
C 19	TC	5	617.8	1228.2	310.7
	FC	5	17.6	124.3	2.5
	FS	5	3.8	18.5	0.8
C 20	TC	3	528.3	4239.2	65.8
	FC	4	31.0	281.5	3.4
	FS	4	3.1	7.4	1.3
C 21	TC	4	318.9	1179.1	86.3
	FC	4	29.1	333.4	2.5
	FS	4	1.9	13.4	0.3
C 22	TC	5	305.3	596.6	156.2
	FC	5	8.1	127.6	0.5
	FS	5	1.1	1.7	0.8
C 22 D	TC	4	287.5	608.0	135.9
	FC	5	2.5	11.9	0.5
	FS	5	1.1	1.7	0.8
C 23	TC	4	823.4	2171.5	312.2
	FC	4	19.1	445.8	0.8
	FS	4	1.2	2.1	0.7
C 24	TC	4	730.6	1051.2	507.8
	FC	4	48.8	252.7	9.4
	FS	4	42.0	302.9	5.8

Balsam Lake - Rosedale

Date: August 17 - 21, 1970

Survey: 1st

Station Number	Parameter	Number of Observations	Geometric Mean (GM) per 100 ml.	95% Confidence Limits on GM	
				Upper	Lower
B 32	TC	5	4489.1	16,758.1	1202.5
	FC	5	49.6	238.5	10.3
	FS	5	1.5	3.3	0.7

* = For one or more samples taken during the survey, a count was not obtained. If a count could have been obtained, the geometric mean might have been higher in value than the mean shown.

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